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January 26, 1995

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FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF SECRETARY

By Hand

Mr. William F. Caton  
Acting Secretary  
Federal Communications Commission  
1919 M Street, NW  
Washington, DC 20554

DOCKET FILE COPY ORIGINAL


Re: LMDS Rulemaking Proceeding  
CC Docket 92-297

Dear Mr. Caton:

On behalf of CellularVision, enclosed please find an original and four (4) copies of a Motion to Proceed in the above-referenced proceeding.

Please direct any questions regarding this matter to the undersigned.

Sincerely,



Michael R. Gardner  
Counsel, CellularVision

Enclosures

cc Attached Service List  
LMDS Rulemaking Record

No. of Copies rec'd  
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Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554

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JAN 26 1995

FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF SECRETARY

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In the Matter of )

Rulemaking to Amend Part 1 and Part 21 )  
of the Commission's Rules to Redesignate )  
the 27.7 - 29.5 GHz Frequency Band and to )  
Establish Rules and Policies for Local )  
Multipoint Distribution Service )  
\_\_\_\_\_ )

CC Docket No. 92-297

**MOTION TO PROCEED**

CellularVision, by its attorneys, hereby files a Motion to Proceed ("Motion") with respect to the above-referenced LMDS Rulemaking Proceeding. CellularVision requests that the FCC abide by its own explicitly detailed commitment in the LMDS Rulemaking Record made a year ago and promptly establish a pleading cycle for comments and reply comments regarding the important public interest benefits that the Commission must balance between LMDS and FSS before it can appropriately allocate the largely fallow 28 GHz spectrum. See Second Notice of Proposed Rulemaking, 9 FCC Rcd. 1394, para. 47 (February 11, 1994) ("Second NPRM").

**I. BACKGROUND**

Since 1986, the Commission has demonstrated a commitment to encouraging the development of LMDS as an innovative two-way video, voice and data service in the 28 GHz band. The Commission's support for this competitive technology has been evidenced by numerous actions over the past eight years:

- Starting in 1986, when the Commission granted the first of numerous

experimental licenses for LMDS providers, permitting LMDS systems to operate in various designated areas in the 28 GHz band;<sup>1</sup>

- Continuing in 1989 and 1992, when the Commission granted CVNY's principals equipment authorizations for their LMDS transmitters;<sup>2</sup>
- In 1991, when the Commission granted CVNY's commercial LMDS license, authorizing CVNY to provide a 24-channel LMDS video system throughout the New York PMSA, utilizing the 27.5- 28.5 GHz band;<sup>3</sup>
- In 1992, when the Commission granted a modification of CVNY's commercial license to allow it to increase its format to a 49-channel LMDS video system throughout the New York PMSA;<sup>4</sup>
- In 1993, when the Commission formally proposed to license LMDS nationwide in the 28 GHz band with two 1 GHz licenses per service area;<sup>5</sup> and
- Also, in 1993, when the Commission granted a coveted tentative pioneer preference award to CellularVision's principals for developing the LMDS technology.<sup>6</sup>

During this eight year period, the Commission has repeatedly stated its support for the competitive application of the LMDS technology, and in the process, the Commission has established a well-developed and compelling record on the public

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<sup>1</sup> Suite 12 Group was awarded three of these experimental licenses by the Commission, and each of these licenses is currently in effect pursuant to subsequent two-year renewals. See Call Sign KA2XLG, granted August 1, 1986, for the tri-state area of New York, New Jersey and Pennsylvania; Call Sign KA2XVG, granted May 20, 1988, for New York, New York, and subsequently transferred to CellularVision of New York, L.P. ("CVNY") on July 23, 1993; and Call Sign KI2XGI, granted November 7, 1991, for the Beverly Hills area of Los Angeles.

<sup>2</sup> See HVFJA1, File No. 31010/EQ 17.9, granted October 11, 1989; HVFJA2, File No. 31010/EQU 17.9, granted January 23, 1992.

<sup>3</sup> See Hye Crest Order, 6 FCC Rcd 332, para. 17-31.

<sup>4</sup> See WLT-379, File No. 10655-CF-MP-92, granted March 16, 1992.

<sup>5</sup> See Notice of Proposed Rulemaking, Order, Tentative Decision and Order on Reconsideration ("First NPRM"), 8 FCC Rcd 557, para. 20 (1993).

<sup>6</sup> See id., paras. 63-65.

interest benefits of deploying LMDS in the fallow 28 GHz band.

In fact, as early as the Commission's 1991 Hye Crest Order, when CVNY was granted a commercial LMDS license for a multi-cell system serving the vast New York PMSA, following a public comment proceeding that commenced in 1988, the Commission recognized that the "proposal offers public interest benefits . . . [and] "that none of the parties to this proceeding disputes that public benefits would be realized through increased competition and greater diversity in programming distribution and sources in the video marketplace." Further, the Commission noted that commercially licensing LMDS for the New York PMSA "will facilitate the introduction of a novel and innovative use of previously unused spectrum" in order to "bring a new and needed multichannel video service to the New York City market in competition with cable television and other video delivery and distribution services." Hye Crest Order, para. 24.

Subsequently, in the First NPRM, when confirming the need to redesignate the 28 GHz spectrum for LMDS, the Commission recognized the large number of parties expressing interest in the revolutionary LMDS technology, as well as the 971 additional applicants seeking to provide similar LMDS-type services. See First NPRM, para. 15. Moreover, the Commission recognized that CellularVision's LMDS technology offers the promise for a wide variety of applications that could be tailored to local interests, reflecting the Commission's desire to promulgate rules which provide the "maximum flexibility for licensees to construct communications systems in which the public is interested." Id., para. 17. Additionally, the Commission agreed with the University of Texas that the deployment of LMDS to serve educational needs in the Rio Grande Valley "potentially would confer substantial educational benefits on

residents of this area and therefore would be commendable." Id., para. 68.

As recently as January 1994, in the Second NPRM, the Commission reiterated its findings in support of the public interest benefits of LMDS, noting that "there appears to be considerable commercial interest in using the spectrum for video distribution services . . . [and] a new source of competition to franchised cable companies, wireless cable companies, and other video service providers would further the public interest by promoting lower prices and new and innovative service offerings." Second NPRM, para. 8. The Commission also recognized the interest created in LMDS, including the potential for LMDS to serve as an outlet for public television and "as a last mile service in connecting with the Clinton Administration's public policy goal of creating an information and educational highway." Id., para 11.

Nonetheless, now, after years of appropriate and well-documented Commission support for LMDS, the Commission is inexplicably derailing this important pro-consumer competitive technology by failing to continue to proceed with its proposal to license LMDS nationwide in the 28 GHz band.

In January 1994, the Commission set forth a procedure for establishing a Negotiated Rulemaking Committee ("NRM") to resolve the technical coordination and sharing issues raised by interested parties in connection with the Commission's proposal to license LMDS in the 28 GHz band with two 1 GHz licenses per service area. See Second NPRM, para. 30. The NRM's mandate strictly limited the NRM's focus to technical issues, and prohibited all discussion relating to the numerous public interest benefits related to systems proposed for the 28 GHz band. This de facto "gag order," limiting comment about the public interest benefits during the NRM and the ensuing four months since the NRM concluded on September 23, 1994, has left a

vast vacuum in the record on the crucial issue of the potential public interest benefits of LMDS versus those from the yet-to-be-tested and publicly scrutinized FSS systems proposed by Hughes Galaxy Communications, Inc. ("Hughes") and Teledesic Corporation ("Teledesic"). Accordingly, to date, interested parties, and particularly the 23 "Public Interest Parties" involved in the LMDS Negotiated Rulemaking, including educational institutions such as the University of Texas and the University of California, and non-profit organizations such as PBS, have not yet had the opportunity to truly participate in the LMDS Rulemaking.<sup>7</sup> This is particularly troublesome since the Commission recognized that if the NRMC was unsuccessful in reaching a consensus regarding technical sharing rules for terrestrial and satellite services in the 28 GHz band, the Commission would require proponents of LMDS and FSS to address the significant void in the record with regard to the public interest benefits of all proposed systems "to enable us [the Commission] to select the best choices among services proposed." Id.

In order to complete the Commission's record in the LMDS proceeding, the Commission enumerated a list of factors which would form the basis for determining how to license services in the 28 GHz band in a manner that would best serve the public interest. Factors to be balanced include the indicia of economic growth attendant to each proposed service, public interest issues such as the educational value of each service, the ability to reach the largest number of potential customers,

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<sup>7</sup> The Public Interest Parties are a group comprised of 23 entities, including the Association of America's Public Television Stations, Public Broadcasting Service, American Council on Education, and a number of educational institutions, including the University of California Systems, University of Arizona, University of Washington, University of Hawaii System and the University of Wisconsin System.

and general timing of the availability and implementation of LMDS versus the "paper-only" FSS proposals.

Nonetheless, now more than one full year after its adoption of the Second NPRM on January 19, 1994, the Commission has yet to invite comment on the public interest factors set forth in the Second NPRM which, as the Commission itself recognized, is an absolute prerequisite to choosing a licensing scheme for the 28 GHz band which best serves the public interest.<sup>8</sup> Rather, the Commission has taken no action in this proceeding since the conclusion of the NRMC over four months ago. As a result of the Commission's inaction, consumers across the United States are being denied the important benefits of LMDS, a revolutionary technology that the Commission itself recognized repeatedly over the past half-decade as capable of providing a diverse range of pro-competitive services.<sup>9</sup> Regrettably, the 28 GHz band

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<sup>8</sup> The NRMC concluded on September 23, 1994, and while a consensus for co-frequency sharing of the 28 GHz band among LMDS and FSS proponents was not reached, significant progress was made in the abbreviated life of this 60-day Committee. In particular, CellularVision reached an agreement with MSS proponent Motorola for LMDS/MSS co-frequency sharing of the 28 GHz band, and this agreement was endorsed by numerous other members of the NRMC, including Rio Vision, Inc., mm-Tech, Inc., International CellularVision Association, Bell Atlantic, University of Texas-Pan American, GHz Equipment Co., Inc./International Communications Engineering, Inc., Texas Instruments, Avoca Laboratories, and the Public Interest Parties.

<sup>9</sup> While expounding on the Commission's obligation to foster competition in the delivery of video services in order to "repave the lines of the information highway," Chairman Hundt recently noted that one of the basic precepts of the FCC's competition policy is that "consumers deserve [a] choice of all communications products." Chairman Hundt's Address to the Electronic Industries Association, January 6, 1994, Las Vegas, Nevada. In view of such public statements about the Commission's interest in promoting competition in the multichannel video marketplace, the Commission's inaction in the LMDS Rulemaking proceeding is particularly troubling.

also remains largely unused.<sup>10</sup>

## II. **ARGUMENT**

### A. **As the Commission's Present Rulemaking Record is Wholly Inadequate to Make a Further Determination Regarding Use of the 28 GHz Band, the Commission Must Proceed in Accordance with its Explicit Commitment in the Second NPRM**

In its Second NPRM, the Commission recognized that,

There is little evidence in the record regarding the likely public interest benefits of the various proposals, including increased access to high-quality, affordable and innovative services, and stimulation of economic growth through increased competition for existing services and introduction of new services that may be expected to stimulate demand and create jobs. Second NPRM, para. 23 (emphasis added).

Moreover, the Commission noted that, "there is little data from which to predict what would be the best licensing choice." Id., para. 26. Specifically, the Commission noted that NASA's experimental ACTS program, the only operational satellite proposal, has not yet demonstrated its commercial feasibility nor proved when an evidentiary basis to predict the benefits of its experiments can even be realized. See id., para. 23.

Furthermore, the satellite "paper" proposals of Hughes and Teledesic are also totally unproven, and have not even been subject to the rigorous technical scrutiny of the Commission's public comment process.<sup>11</sup> It is noteworthy that both the economic

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<sup>10</sup> Ironically, no satellite interests have requested use of 27.5 - 28.5 GHz band other than the Teledesic "GigaLink" Terminal, which by definition will be few in number and located in rural areas. Sufficient spectrum is available for such terminals in bands below 27.5 GHz and above 29.5 GHz.

<sup>11</sup> When and if the Hughes and Teledesic proposals are exposed to the public for formal technical scrutiny, interested parties are likely to raise a number of serious concerns about their viability. For example, the current parameters of the Teledesic system raise a number of troublesome issues, including the serious potential radiation hazard posed by Teledesic's high-power "GigaLink" terminals, and the fact that Teledesic's system appears to be self-jamming and thus incapable of functioning as



and technical viability of Teledesic's proposed system has been publicly questioned. Upon its public unveiling, the Teledesic system was hit by skepticism from industry experts and financial analysts, with typical reactions ranging from "God save us, it's the stupidest damn thing I've ever heard of," to "[i]t ain't gonna work,"<sup>12</sup> to "by the time the last of the 840 satellites are placed in orbit, the first one could already be technically obsolete."<sup>13</sup> Given these uncertainties about the proposed Hughes and Teledesic systems, which may never emerge from the drawing boards, and even if they do, are years away from being operational, it is bewildering that the Commission has allowed the LMDS Rulemaking to be held hostage by the powerful proponents of untested paper FSS proposals. It is interesting to note that full implementation of the technically unproven Teledesic system throughout the U.S. would yield simultaneous telephone service to only 0.18% of the population, whereas LMDS simultaneously can serve 90% of the population.<sup>14</sup> The Teledesic system is even more constrained for data communications service, as Teledesic could supply this digital service simultaneously to only 0.0018% of the population.<sup>15</sup>

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proposed. See Teledesic GigaLink Radiation Hazard Study, by Jeffrey Krauss (attached as Exhibit A); Observations on the Teledesic System Concept, by CVNY (attached as Exhibit B).

<sup>12</sup> John J. Keller, "McCaw-Gates Satellite Plan Draws Skeptical Reviews," The Wall Street Journal, March 22, 1994 at B4 (quoting John Pike, director of the Federation of American Scientists' Space Policy Project, and Howard Anderson of the Yankee Group, respectively) (attached as Exhibit C).

<sup>13</sup> Scott Faber, "Global Ambitions," Discover, January 1995, page 100 (attached as Exhibit D).

<sup>14</sup> See Comparison of Telephone Service Capacity of LMDS and Teledesic System, by Bernard Bossard (attached as Exhibit E).

<sup>15</sup> See id.

By contrast, CellularVision's LMDS video system is currently operational in the New York PMSA pursuant to the Commission's grant of a commercial license in 1991. See Hye Crest Management, Inc., 8 FCC Rcd 332 (1991) ("Hye Crest Order"). Under this commercial license, CVNY offers consumers in Brighton Beach, New York, a high quality, 49-channel video programming service for \$29.95 a month as an alternative to cable television. CVNY also has developed a fully-staffed operations center to service its subscribers throughout the New York PMSA. In addition, since June 1994, CVNY has filed 34 transmitter applications designed to immediately expand its LMDS video service throughout the New York PMSA in accordance with the Commission's authorization of a multi-cell system in granting the commercial license in 1991.<sup>16</sup> Unfortunately, CVNY's expansion to a multi-cell system as provided for by its 1991 commercial license remains inexplicably blocked by Commission inaction, the same type of salient, unwarranted inaction that has derailed the LMDS Rulemaking proceeding — a proceeding which ultimately could provide LMDS access to consumers throughout the United States.<sup>17</sup>

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<sup>16</sup> Despite the Commission's recognition that CVNY's system will "bring a new and much needed multichannel video service to the New York City market in competition with cable," the Commission has yet to act upon CVNY's 34 transmitter applications. Hye Crest Order, para. 24. The first of the 34 applications was filed on June 22, 1994, and following challenges by Hughes and Teledesic on August 19, 1994, and responsive pleadings by CVNY, no action has been taken on the application. CVNY's second application filed July 7, 1994, as well as 32 other applications filed October 14, 1994, have not even been placed on public notice by the Commission.

<sup>17</sup> Any suggestion in the ongoing LMDS rulemaking concerning the use of alternate spectrum for LMDS, including the 40 GHz, is totally unsupported in the record. In fact, the Commission has previously considered and dismissed any suggestion that LMDS could operate in higher frequency bands, recognizing that the 31 GHz or 40 GHz bands, for example, are too narrow in bandwidth, not sufficiently contiguous, and not adequately protected to support LMDS, leaving the "28 GHz band

CellularVision and the other LMDS proponents have submitted numerous filings in the LMDS rulemaking record which demonstrate the public interest benefits of LMDS.<sup>18</sup> Moreover, CellularVision welcomes the opportunity to provide additional data with regard to the economic, public interest and timing issues enumerated by the Commission in the Second NPRM, and believes that all parties must have that opportunity before the Commission can move forward with an appropriate resolution of the LMDS rulemaking proceeding.<sup>19</sup> Indeed, in the Second NPRM, the Commission specifically noted that it would "require a record to enable [it] to select the best

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the most suitable frequency band available" for LMDS. Hye Crest Order, para. 11, 21.

Additionally, in response to more recent requests by Hughes and Norris that LMDS should be allocated in the 37 GHz or the 40 GHz bands, the Commission in the Second NPRM specifically dismissed these requests, stating that "we will not grant further consideration to [these] suggestions since there is no evidence in the record that the beneficial uses we anticipate from point-to-multipoint use of the 28 GHz band are likely to materialize at the higher bands." Second NPRM, n.15 (emphasis added). Moreover, the Commission appropriately recognized that by precluding LMDS from immediately using the 28 GHz band, LMDS "either may never become available or may be considerably delayed while another block of spectrum is found and new technologies developed." Id., para. 44.

<sup>18</sup> See The Need for Wideband Services, submitted 11/22/93; Telephony and Other Secondary Services Available Through Suite 12's LMDS Technology, submitted 1/11/94; Broadbased Consumer and Press Support for Suite 12's LMDS Technology, submitted 1/12/94; LMDS Summary Paper, submitted 1/12/94).

<sup>19</sup> The United States Small Business Administration ("SBA") implored the Commission to establish a record on the public interest benefits of all proposed 28 GHz band spectrum users, and voiced its opinion that such a record, when fully developed, would support "an allocation weighted towards terrestrial use [which] will meet the primary statutory mission of the FCC — making available rapid, efficient, and national communications services. 47 U.S.C. § 151." Comments of the Chief Counsel for Advocacy of the U.S. Small Business Administration on the Second NPRM, filed 3/28/94, p. 2 (attached as Exhibit F). In addition, the SBA stated that terrestrial-based services in the 28 GHz band will best promote the public interest since such services would increase the opportunities for small business providers and provide greater benefits to small business users. See id.

choices among services proposed." Second NPRM, para. 47. Therefore, the Commission cannot, consistent with its language in the Second NPRM, conclude the LMDS Rulemaking until the Commission has before it in the LMDS record a full set of comments from parties who can document the public interest benefits of their proposed service, whether LMDS or FSS-based.<sup>20</sup> Until that time, any premature attempt by the Commission to conclude the 28 GHz proceeding on the basis of the present record would constitute arbitrary and capricious action on the part of the Commission, as it would be inconsistent with the Commission's own requirements for public interest comments articulated in the Second NPRM.<sup>21</sup>

The Commission enumerated the precise public interest factors it would examine when considering which service(s) to select to utilize the 28 GHz band. Specifically, the Commission requested detailed information regarding when particular services could be made available, as well as which service(s):

- hold the greatest potential for stimulating lower prices and higher demand for services
- offer competition in existing markets

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<sup>20</sup> Towards that end, Teledesic's and Hughes's systems must be placed on public notice promptly in order to have these "paper proposals" subjected to the appropriate intense technical, public examination and analysis that is necessary before it is known whether those proposals are even viable.

<sup>21</sup> In view of the fact that any conflict between LMDS and FSS systems would be due to interference that would be caused by FSS earth stations to LMDS receivers, and that the CellularVision/Motorola Joint Rule provides a framework for LMDS/MSS co-frequency sharing, the FSS is the only "non-sharable" service involved in this proceeding. Accordingly, given the outcome of the NRMCC, only the FSS should be at risk of being excluded from the 28 GHz band, particularly since the FSS already enjoys, without spectrum auction payments, large chunks of the spectrum in the C-band and Ku-band. See Statement of Walter L. Morgan (attached as Exhibit G).

- permit the greatest number of service providers through spectrum efficiencies
- promote the offering of new, high-quality and innovative service
- promise to create the greatest number of high-paying jobs
- create most valuable service to the broadest segment of the population
- reach unserved areas
- promote educational and health care
- facilitate the development of a National Information Infrastructure
- provide broadband telecommunications to the home
- become available and materialize

Taken together, the Commission noted that specific information on these factors "would permit us to base a decision on the public interest impact of various options." Id., paras. 47, 48.

Notwithstanding the fact that the Commission has recognized that the record in several proceedings already contains information documenting the public interest benefits of LMDS, and consistent with the Commission's explicit commitment set forth in the Second NPRM, the Commission must provide all parties with a formal opportunity to comment on the relative public interest benefits of the proposed services as set forth in paragraph 47 of the Commission's Second NPRM.

### **III. Conclusion**

A full year after issuing its Second NPRM, it is inexcusable for the Commission to fail to proceed in accordance with its Second NPRM to develop the public interest aspect of the rulemaking record that is a necessary predicate to the Commission's

informed decision about the most appropriate licensing scheme for the 28 GHz band. The presently stalled LMDS Rulemaking, which commenced in January 1993 with the Commission's issuance of the First NPRM, is now entering its third year without resolution. This unwarranted delay is contrary to the often expressed Commission goal of developing LMDS as an alternative to cable<sup>22</sup>; it also reflects a total disregard for the concerns of Commissioner Barrett, as articulated in his statement issued with the Second NPRM when he stated that the Commission should not "unnecessarily delay the introduction of new services or technology in the near term" and that no Commission process, including the formulation of an NRMCM, should be "used as a means of unduly delaying the market entry of viable, innovative services..." Separate Statement of Commissioner Andrew C. Barrett, Second NPRM, 9 FCC Rcd 1405.<sup>23</sup> The Commission's obligation to promptly commence a public comment period to establish the necessary record in accordance with the public interest factors set forth in the Second NPRM is now long overdue. Any further Commission action in the instant 28 GHz LMDS Rulemaking proceeding without first conducting the required

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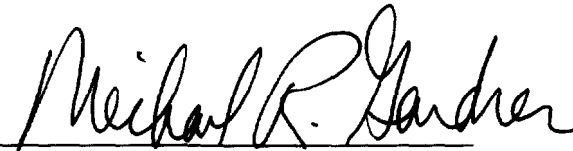
<sup>22</sup> In the Hye Crest Order, the Commission noted that CellularVision's LMDS proposal would "bring a new and needed multichannel video service to the New York City market in competition with cable television and other video delivery and distribution services..." Hye Crest Order, para. 24. Additionally, in its First NPRM, the Commission noted that LMDS in the 28 GHz band "would provide additional competition for franchised cable companies" and that "[a] new source of competition for franchised cable companies, wireless cable companies, and other video service providers furthers our goal of using the disciplines of the marketplace to regulate the price, type, quality and quantity of video services available to the public." First NPRM, at para. 16.

<sup>23</sup> The excessive delay in resolving the ongoing LMDS Rulemaking is also contrary to the explicit Congressional mandate found in 47 U.S.C. § 157, which charges the Commission to "encourage the provision of new technologies" and to complete any proceeding for a new technology or service within 12 months of initiating the proceeding. See 47 U.S.C. §157 (a),(b) (emphasis added).

public interest inquiry is arbitrary and capricious. Moreover, the Commission cannot and should not derail the promising LMDS technology out of its continued inordinate deference to a few giant satellite companies, Hughes and Teledesic, who are promoting totally unproven and untested "paper" proposals that have not even been subjected to the sober scrutiny of the Commission, the public or Wall Street — all of which may find these would-be FSS systems unworkable, impracticable and/or unaffordable.

Respectfully submitted,

CellularVision

By: 

Michael R. Gardner  
Charles R. Milkis  
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January 26, 1995

**EXHIBIT A**



# Teledesic GigaLink Radiation Hazard Study

Prepared by Jeffrey Krauss  
October 21, 1994

This paper reports on radiation hazard calculations done for the Teledesic GigaLink Terminal in the 27.5-28.5 GHz band, for two different antenna sizes. The sizes are the minimum and maximum that Teledesic plans to use. For the smaller antenna, a hazardous region exists out to 17 meters (50 feet) from the antenna. For the larger antenna, a hazardous region can exist out to 90 meters (270 feet).

## Background

A radiation hazard calculation is required by Section 1.1307(b) of the Commission's Rules. This requires the submission of an Environmental Assessment as part of a satellite earth station license application if the guidelines for radiofrequency radiation levels are exceeded.<sup>1</sup>

The current FCC Rules require compliance with 1982 ANSI standard (ANSI C95.1-1982), which recommends a maximum permissible exposure level of 5 mW/cm<sup>2</sup> in the frequency range 1.5 GHz to 100 GHz. The 1992 ANSI/IEEE standard (ANSI/IEEE C95.1-1992, also referenced as IEEE C95.1-1991) recommends a maximum permissible exposure level of 10 mW/cm<sup>2</sup> in the frequency range 15 GHz to 300 GHz. The FCC has a proceeding underway to adopt the 1992 standard for use in evaluating the environmental effect of RF exposure. Notice of Proposed Rulemaking in ET Docket No. 93-62, 8 FCC Rcd 2849 (1993) (cited as "FCC NPRM").

Guidelines issued by the National Council on Radiation Protection and Measurements (NCRP) specify a level of 1 mW/cm<sup>2</sup> in the frequency range 1.5 GHz to 300 GHz. See FCC NPRM at fn. 27. The International Radiation Protection Association's guidelines recommend 1 mW/cm<sup>2</sup> between 2 GHz and 300 GHz. See FCC NPRM at fn. 28.

This paper uses the current value of 5 mW/cm<sup>2</sup> for calculations.

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<sup>1</sup>The FCC reference document for performing radiation evaluations is OST Bulletin No. 65, "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radiofrequency Radiation," October 1985, NTIS #PB 86-127081. The detailed procedures for an earth station radiation evaluation are contained in "Guidelines for Filing Domestic Satellite Earth Station Application", Report No. DS-1231, September 29, 1992.

### **Calculations of Power Density**

The table on the next page displays the results of calculations of power densities for the Teledesic GigaLink terminal for two different antenna sizes. The following formulas were used.

The maximum power density in the near field is calculated as four times the output power divided by the area of the antenna. OST Bulletin No. 65, p. 17.

The distance to the start of the far field (the point at which the power density begins to decrease with the square of the distance) is given in OST Bulletin 65 as:

$$R = 0.6 \frac{D^2}{\lambda}$$

where  $D$  is the antenna diameter. The table on the next page shows the power density at the start of the far field, calculated as follows:

$$S = \frac{PG}{4\pi R^2}$$

where  $S$  = power density,  $P$  = output power,  $G$  = antenna gain and  $R$  = distance.

It also shows the distance where the power density equals the maximum permissible exposure level of 5 mW/cm<sup>2</sup>, using this same formula.

### **Conclusions**

For the smaller antenna that Teledesic plans to use (0.28 meters), a hazardous region exists out to 17 meters (50 feet) from the antenna. For the larger antenna (1.6 meters), a hazardous region can exist out to 90 meters (270 feet).

# Calculations of Radiation Hazard Levels for Teledesic Gigalink Terminals

power (watts)	antenna diameter (meters)	antenna gain (dBi)	ERP (dBW)	ERP (watts)	max power density near field (mW/cm <sup>2</sup> )	distance to far field (meters)	power density start of far field (mW/cm <sup>2</sup> )	distance to power density limit (meters)	power density limit (mW/cm <sup>2</sup> )
49	0.28	36	53	199286	318.47	4.61	74.69	17.82	5.00
49	1.6	50	67	5011872	9.75	150.59	1.76	89.33	5.00

**EXHIBIT B**

**PRELIMINARY TECHNICAL ANALYSIS OF POTENTIAL  
FSS/LMDS SHARING SOLUTIONS  
AND  
OBSERVATIONS ON  
THE TELEDUSIC SYSTEM CONCEPT**

**Prepared by  
*CellularVision of New York, L.P.***

**December 15, 1994**

**PRELIMINARY TECHNICAL ANALYSIS OF POTENTIAL  
FSS/LMDS SHARING SOLUTIONS  
AND  
OBSERVATIONS ON THE TELEDESIC SYSTEM CONCEPT**

**Introduction**

The purpose of this paper is to revisit issues related to the potential for FSS/LMDS co-frequency sharing which were initially addressed in the Negotiated Rulemaking Committee on 28 GHz FSS/LMDS and have since been inaccurately represented by Teledesic Corporation. Additionally, based on a review of the Teledesic application to the FCC to provide Fixed Satellite Service and other subsequent position papers by Teledesic, some observations are made about the viability of the Teledesic concept for providing FSS. While many questions have been raised in both general circulation and trade press articles addressing the Teledesic plan, it is instructive to review issues related to the potential for Teledesic success and its attributes relative to the commercial LMDS system CVNY currently operates in New York City.

**Summary**

The impact of the discussion in the following sections can be summarized as follows. First, the mitigation factors to be addressed in the post-NRMC time frame by a consortium of Satellite and LMDS proponents, many of which are outlined in the BellCore Paper, "Interference from FSS Uplink into LMDS Receivers: The Impact of Improved Antenna Patterns," which was recently subjected to unsubstantiated attacks by Teledesic, offer significant promise for a sharing solution, and are precisely the issues that the NRMC expressed regret in not having time to pursue. Subsequent filings with the Commission, which will be made only after key technical issues have been addressed with the necessary engineering discipline, will document the sharing potential of these mitigation factors. Secondly, there is extreme doubt as to the viability of the Teledesic technical/business concept -- consequently, Teledesic has created contradictions in its actions regarding co-frequency sharing to deflect attention from inherent Teledesic flaws.

### **Impact of "Ubiquitous" Teledesic Terminals on LMDS Receivers**

Teledesic's assertion that 'ubiquitous' Teledesic earth stations and LMDS receivers cannot co-exist because of interference to LMDS receivers is simply not borne out by the facts. Moreover, only the Teledesic Gigalink terminal uplink transmitter occupies the band in question (27.5 to 28.5 GHz). No other satellite interest has requested operations in the band. As will be demonstrated below, Teledesic is a low-capacity, self-limiting system which imposes upon itself an inherent "cap" on the number of Teledesic terminals than can be deployed in a given area. In spite of this, Teledesic has refused to consider, in a manner in direct contradiction with its stated intentions in its application to the Commission, simple mitigation techniques which can drive the community toward an effective sharing solution. "Ubiquity," for the Teledesic system, means, at most, a single active T1 terminal with an approximate 10 percent duty cycle in every 200 square kilometers averaged over the Teledesic service area. Even more incredible is the fact that, based on the Teledesic system design, that the expected number of "Gigalink" terminals in the New York PMSA is 0.03. That is, the Teledesic system design can handle an average of only one Gigalink terminal in every 97,867 square kilometers—an area 33 times larger than the New York PMSA. Moreover, due to the potential radiation hazard associated with the operation of the Gigalink terminal and Teledesic's stated intentions to serve rural areas with the Gigalink terminal, it is highly likely that no Gigalink terminals will be operated in the New York PMSA. The impact of this type of Teledesic terminal deployment is obviously so minuscule that it is insignificant when measured against the potential of LMDS, which can provide voice, data, and video services to all residents of the New York PMSA. LMDS is the only wireless broadband technology that can provide access to the "information superhighway" and a cable alternative to all of the New York PMSA.

Calculations using conventional antennas (based on measured data or ITU sidelobe masks) clearly show that, to protect against interference in the overwhelming majority of cases, the expected protection distance necessary between a T1 Teledesic earth station and an LMDS receiver is less than 100 feet. Teledesic consistently falls back to the position that protection distances for cases where the Teledesic terminal is in the mainlobe of the LMDS receiver antenna are larger, but LMDS deployment conventions would not create this position—the Teledesic terminal would block the LMDS signal from the receiver. These are simple truths, but truths that Teledesic chooses to ignore.

## **Teledesic Approaches to Sharing with Terrestrial Systems**

Teledesic, while denying that potential solutions exist and misrepresenting the conclusions of the NRMC, has made its own claims regarding interference mitigation factors when its purposes are served. Fortunately, the rules of physics are constant regardless of Teledesic's corporate tactics. Teledesic, in its application to the Commission (page 79) states that it will "shield" its terminals at low elevation angles and utilize low sidelobe antennas to avoid interference with terrestrial systems sharing the band. Further Teledesic states that it will work with terrestrial operators to deal with the rare instances in which antennas and shielding will not suffice. Both of these "offerings" by Teledesic are representative of what must be closely examined by all satellite and LMDS parties to maximize sharing potential.

In fact, if one projects the protection distances between a Teledesic Terminal and LMDS receiver required to avoid harmful interference based on the shielding and sidelobe reduction that Teledesic alludes to, an improvement of 20 dB or more on attenuation of the undesired Teledesic signal may be expected. Given this, under most conditions with these achievable (according to Teledesic) improvements in interference suppression, the separation distance necessary is less than 50 feet.

It is compelling to note that with the Teledesic terminal deployment densities to which Teledesic restricts itself (an active T1 terminal in every 200 square kilometers or an active Gigalink Terminal in every 97,867 square kilometers), there may well be more terrestrial line-of-sight systems operating co-frequency in the band than Teledesic terminals. The same would be true for the relative numbers of Teledesic terminals and LMDS receivers. Given this, the sidelobe suppression and terminal shielding techniques, "promised" by Teledesic but forgotten when it considers sharing issues with LMDS, will be as applicable to LMDS sharing as to terrestrial LOS sharing.

Teledesic has focused on a sharing analysis method which focuses on the percentage of an LMDS cell from which Teledesic terminals would be excluded based on interference characterizations. Notwithstanding the fact that its interference characterizations are inaccurate, if the same approach is taken to characterize the sharing situation for terrestrial LOS systems, the results would show that the same interference remedies that Teledesic claims are preposterous (sidelobe suppression, shielding and frequency planning) with regard to LMDS will be required for terrestrial LOS systems.



### Potential Antenna Improvements--The Reality

While Teledesic has heralded sidelobe suppression as an interference mitigation technique in its application to the Commission (see above), it concurrently has attempted to distract attention from any rational examination of its potential in engineering terms. Without speculating about the motivation of Teledesic for its inconsistent actions, it is instructive to consider the potential for improved sidelobe suppression. As an example of sidelobe suppression improvements which might be expected, Attachment A (courtesy of Andrew Corporation) shows the Teledesic TST terminal antenna mask along with two other masks for improved 28 GHz antennas. Note the alternative antennas have the same peak gain as the TST antenna, but offer significantly better sidelobe suppression. At 40 degrees off boresight (the minimum angular separation between the pointing angle of the Teledesic antenna and an LMDS receiver by Teledesic's own reasoning) the sidelobe suppression improvement over the Teledesic antenna is 20 to 30 dB. For other more likely separation angles, the improvement is more than 40 dB. This 40 dB additional isolation gained from one antenna alone results in a 100-to-one reduction in the necessary protection distance between the Teledesic terminal and LMDS receiver (the improvement in antenna discrimination, in dB, is proportional to  $20 \log(\text{range ratio})$ ). This is possible with *current* antenna technology. A key reason for the large difference is sidelobe suppression is due to Teledesic's choice of the ITU699 mask to represent its terminal antenna. The ITU specification is only a *mask* which establishes minimal antenna performance standards--the mask was established many years ago and does not preclude the employment of *better performing* antennas. Yet Teledesic, in order to minimize the *apparent* potential for co-frequency sharing, chooses to use antenna representations several generations behind current technology. This is astounding given that Teledesic is so obviously willing to reach beyond reason and practicality with respect to other aspects of its design.

### Capacity Limitations Resulting from Teledesic Self-Interference

Teledesic's own estimates of system capacity, employed in this paper to examine Teledesic's inherent viability and sharing potential, are likely optimistic. (If this is the case, the Teledesic system viability from a business standpoint is reduced accordingly, and the potential for spectrum sharing with LMDS is accordingly increased.) The Teledesic system capacity is critically dependent on the system's ability to discriminate between co-frequency signals simultaneously arriving at the satellite from as many as